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CONSIDERATIONS IN NO-TILL SMALL GRAIN PRODUCTION

D.C. Ditsch, J.H. Grove, L.W. Murdock, and J.H. Herbek

Small grains have become an important component of many crop rotations in Kentucky. Seedbed preparation has typically involved various degrees of tillage in which much of the residue from the previous crop is buried. Under such conditions, a field may be vulnerable to severe soil loss during periods of heavy rainfall until the plants have produced enough vegetative growth to cover the soil surface. Eliminating tillage in small grain production would not only reduce soil loss but also reduce labor cost and increase the timeliness of planting. Interest in no-till small grain production is growing. One survey reports that in 1983 approximately 50,000 acres of small grains were planted using no-tillage in Kentucky. Research information on winter survival, seed placement, residue management, and nitrogen fertilization is now becoming available.

Winter Survival

Freezing and thawing conditions during the winter months often force the root system of the plant to the surface, exposing the roots to adverse environmental conditions. In no-till systems, crop residues on the surface act to insulate the soil, keeping the soil warmer longer as air temperatures begin to decrease. Crop residue also prevents the soil from warming quickly during temporary warming periods and this reduces the potential for winter heaving. Generally, most winter-hardy wheat and barley varieties are capable of surviving average winter weather without no-till. There is evidence that the no-till environment may improve the odds of survival.

Equipment and Seeding Rates

There are a number of grain drills on the market designed for no-till small grain seeding. In order to insure proper seed placement, the amount of residue coverage, planting speed, row spacing, drill weight, and soil moisture conditions should be considered and monitored closely. Drill depth control may have to be reset whenever soil or residue conditions change, even within one field. As the soil begins to dry, additional weight may be needed on lighter drills in order to insure proper planting depth. Drills with very narrow row spacing may be limited to a shallow seeding depth even with the addition of extra weight. Narrow row spacing tends to dilute the overall weight delivered per coulter. Planting speed becomes even more critical when the soil is dry. At higher speeds the grain drill will have a tendency to raise up and reduce the planting depth. If the soil is wet, coulters may press residue into the slit rather than cut

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through it and place the seed in a cradle of plant debris. This results in poor seed:soil contact. If soil conditions are less than optimal, no-till seeding rates may have to be increased by 15 to 30 lbs. per acre.

Residues, Diseases, and Weeds

Crop residues should be managed according to the type of grain drill to be used. As row spacings are reduced, less space is available for crop residues to pass through double disc openers, press wheels, coulters and other parts of the grain drill assembly. When crop residues are spread evenly over the field, grain drills with narrow row spacing can operate more efficiently. Heavy combine residue, especially after a good corn crop, should be chopped and evenly spread. Wheat planted after corn will be subject to somewhat greater risk of head scab, as the causal organism is parasitic to both crops. At present, this disease-residue association has not yet been observed to any significant extent in Kentucky.

Weed control in no-till small grain production has been found to improve when rotated after corn and soybeans. If weeds are present or beginning to emerge, then a contact herbicide should be used prior to planting. Direct overseeding of the small grain into standing soybeans or grain sorghum, if done continuously, has resulted in increased weed pressure.

Nitrogen Fertilization

The residue remaining on the soil surface in no-till wheat is thought to influence nitrogen availability in ways similar to those observed in no-till corn production. Nitrogen fertilizer applied on the surface can be tied up in the residue during decomposition or lost via denitrification during periods when the soil is too wet. A portion of the applied nitrogen is lost or unavailable for plant uptake and nitrogen deficiencies may result. Current fertilizer recommendations call for 60 to 90 lbs. N/acre for small grains. No-till producers should stay in the higher end of the range, using 80-90 lbs. N/acre.

When large reservoirs of carry-over nitrogen are available to the small grain crop and high rates of nitrogen fertilizer are applied, the potential for lodging is increased. However, in the no-till system the small grain recovers less N, and research observations indicate a substantial reduction in lodging pressure.

Conclusions

Assuming recommended adjustments are made in nitrogen management and seeding rates as specific conditions dictate, no-tillage wheat and barley appear to perform as well as those planted in a conventional seedbed. No-tillage should not be considered primarily as a tool for higher grain production, but as an alternative establishment method capable of improving the timeliness of planting for all components of the double crop system (barley, wheat, grain sorghum, soybeans) in Kentucky. Additional benefits in soil and water conservation are important as well.